

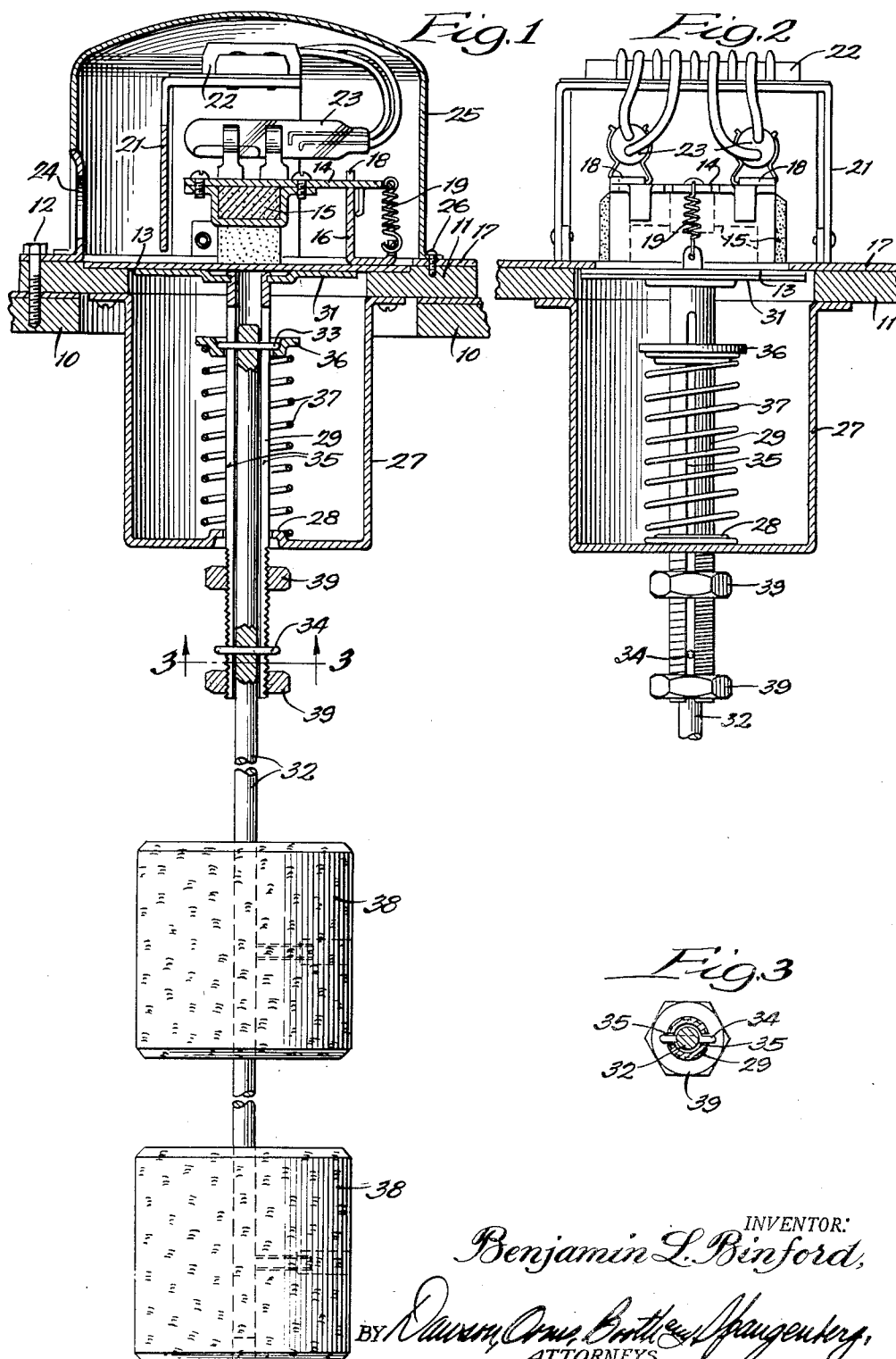
Aug. 21, 1951

B. L. BINFORD

2,564,655

MAGNETIC CONTROL DEVICE

Filed May 18, 1949



INVENTOR:
Benjamin L. Binford,

BY *Dawson, Criss, Barth & Spangenberg,*
ATTORNEYS.

UNITED STATES PATENT OFFICE

2,564,655

MAGNETIC CONTROL DEVICE

Benjamin L. Binford, Chicago, Ill., assignor to
Magnetrol, Inc., Chicago, Ill., a corporation of
Illinois

Application May 18, 1949, Serial No. 93,938

7 Claims. (Cl. 172-284)

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This invention relates to magnetic control device and more particularly to a control device in which movement of one magnetic element toward and away from a complementary element causes the latter to move to effect a control unit.

One of the objects of the invention is to provide a magnetic control device which is simple and inexpensive to construct and install and which is positive and reliable in operation.

Another object is to provide a magnetic control device in which a movable magnet mounted on one side of a non-magnetic wall portion is attracted and released by an armature movable linearly toward and away from the other side of the wall portion. In a typical installation the wall portion is horizontal with the magnet carried by a pivoted head above it and with the armature moved vertically toward and away from the bottom of the wall portion by a liquid displacer or similar actuator.

Still another object is to provide a magnetic control device in which a lost motion connection is provided between the actuator and the linearly movable armature. In the preferred construction the armature is carried by a tube and is actuated by a rod slidable in the tube and having a pin engageable with adjustable abutments on the tube.

The above and other objects and advantages of the invention will be more readily apparent when read in connection with the accompanying drawing, in which—

Figure 1 is a vertical section with parts in elevation of a magnetic control device embodying the invention;

Figure 2 is a section at right angles to Figure 1 showing certain of the parts in elevation; and

Figure 3 is a section on the line 3-3 of Figure 1.

The device, as shown, is adapted to be mounted on the top of a tank a portion of whose top wall is shown at 10. For this purpose the device includes a mounting or supporting plate 11 to fit over an opening in the tank top wall and to be secured in sealed relation thereto by mounting screws 12. The plate 11 is annular and carries at its central part a plate or wall portion 13 of non-magnetic material such as brass.

Above the plate 13 there is pivotally supported a magnetic head comprising a horizontal plate 50

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14 carrying a permanent magnet 15 at one end with the poles of the magnet facing downward. The plate 14 is supported by an upright flange 16 formed from a sheet 17 overlying the plate 11 and having upwardly extending ears 18 to fit into notches in the sides of the plate 14. A spring 19 is connected to the free end of the plate 14 to urge it downward to raise the magnet 15.

A frame 21 may be mounted above the plate 13 to carry a terminal block 22 connected to a pair of tiltable mercury switches 23 supported on the head 14. While two switches are shown, it will be understood that only a single switch or more than two switches could be used, as desired. Connections from the terminal block may extend through an opening 24 to suitable external control or indicating devices. The entire mechanism as so far described is enclosed in a cover 25 secured by screws 26 to the plate 11.

On its lower surface the plate 11 carries a guide structure 27 which is shown as a cup shaped stamping bolted at its upper opening edge to the bottom of the plate 11 and having a central guide hole in its lower end defined by an annular raised ridge 28 to serve a spring centering device. A sleeve 29 extends slidably through the opening in the guide 27 and is of a length to project below the guide when its upper end is adjacent the plate 13. At its upper end the tube carries a magnetic armature 31 which will register with the magnet 15 when the tube is in its elevated position.

The tube slidably receives an elongated actuator rod 32 which extends vertically into the tube and which carries at spaced points in its length a pair of crossed pins 33 and 34. The ends of the pins extend through slots 35 in the sides of the tube and beyond the outer surface of the tube. The pin 33 engages a collar 36 which is slidable on the tube and which is urged upward by a spring 37 centered by the projection 28. Since the pin 33 is freely slidable relative to the sleeve, it will be seen that the spring urges the actuator rod 32 upward without affecting the sleeve or the armature.

To move the armature, the actuator rod 32 carries a pair of spaced liquid displacers 38 which function as more particularly described and claimed in my copending application Serial No. 93,937, filed May 18, 1949. These displacers will raise and lower the actuator rod in response to

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fluctuations in liquid level in the tank to raise and lower the pin 34. The lower portion of the sleeve 29 is threaded as shown adjustably to receive a pair of stop nuts 39 positioned on opposite sides of the pin 34 to be engaged by the pin as it moves. The stop nuts may be adjustably set any desired distance apart to provide any desired extent of lost motion between the rod 32 and the sleeve 39.

With the parts in the position shown, the armature 31 is raised to attract the magnet 15 which is lowered to rock the head 14 counter-clockwise. This will tilt the mercury switches 23 to the left and in the case of the switch shown in Figure 1 will cause it to open. It will be understood that the other switch could be closed, if desired, and that any arrangement for opening or closing the switches in accordance with movements of the liquid displacers could be provided. The sleeve and armature will be held up in the position shown by attraction of the magnet on the armature even though the pin 34 has moved away from the upper stop nut 39.

If the liquid level falls, the displacers will move downward until the pin 34 engages the lower stop nut 39. Further continued downward movement will pull the armature away from the plate 13 decreasing the magnetic attraction between the armature and the magnet until the spring 19 raises the magnet and rocks the head counter-clockwise. At this time the switches 23 will be tilted to the right to the opposite circuit control position from that shown in Figure 1.

The parts will remain in this position until the displacers have again been elevated sufficiently to bring the pin 34 into engagement with the top stop nut 39. After this occurs, further upward movement of the displacers will raise the sleeve 29 and the armature 31. When the armature 31 approaches the plate 13 closely, the attraction between it and the magnet will become sufficient to rock the head 14 to the position shown, thereby tilting the switches 23 to effect the desired indicating or control operation. By adjustment of the spacing between the stop nuts 39, the amount of lost motion between the actuating rod and the armature can be adjusted to produce the desired control operation. It will be seen that the entire structure can be fabricated and assembled simply and inexpensively, and when installed will provide a highly reliable and positive type of operation.

While one embodiment of the invention has been shown and described in detail herein, it will be understood that this is illustrative only and is not to be taken as a definition of the scope of the invention, reference being had for this purpose to the appended claims.

What is claimed is:

1. A magnetic control device comprising a support having a substantially horizontal non-magnetic wall portion, a head pivoted on a horizontal axis above the wall portion and having a magnetic pole movable toward and away from the wall portion, means yieldingly urging the head in a direction to move the pole away from the wall portion, a magnetic armature below the wall portion, a tubular sleeve connected to the armature to guide it for vertical movement toward and away from the wall portion, an actuator rod slidable in the sleeve, and a lost motion connection between the rod and the sleeve.

2. A magnetic control device comprising a support having a substantially horizontal non-magnetic wall portion, a head pivoted on a horizontal

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axis above the wall portion and having a magnetic pole movable toward and away from the wall portion, means yieldingly urging the head in a direction to move the pole away from the wall portion, a magnetic armature below the wall portion, a tubular sleeve connected to the armature to guide it for vertical movement toward and away from the wall portion, an actuator rod slidable in the sleeve, a pin on the rod projecting through a slot in the sleeve, and spaced adjustable stop nuts on the sleeve engageable with the pin to provide a lost motion connection between the rod and the sleeve.

3. A magnetic control device comprising a support having a substantially horizontal non-magnetic wall portion, a head pivoted on a horizontal axis above the wall portion and having a magnetic pole movable toward and away from the wall portion, means yieldingly urging the head in a direction to move the pole away from the wall portion, a magnetic armature below the wall portion, a tubular sleeve connected to the armature to guide it for vertical movement toward and away from the wall portion, an actuator rod slidable in the sleeve, a spring connected to the rod urging it in one direction, a liquid displacer connected to the rod to urge it in the other direction, and a lost motion connection between the rod and the sleeve.

4. A magnetic control device comprising a support adapted to be mounted in the top of a tank and having a horizontal non-magnetic wall portion, a guide extending below the horizontal wall portion, an elongated tubular member slidably supported by the guide for vertical movement toward and away from the wall portion, a magnetic armature carried by the tubular member adjacent its upper end, an actuator rod slidable in the tubular member, and a lost motion connection between the rod and the tubular member.

5. A magnetic control device comprising a support adapted to be mounted in the top of a tank and having a horizontal non-magnetic wall portion, a guide extending below the horizontal wall portion, an elongated tubular member slidably supported by the guide for vertical movement toward and away from the wall portion, a magnetic armature carried by the tubular member adjacent its upper end, an actuator rod slidable in the tubular member, a pin on the actuator rod projecting through a slot in the tubular member, and spaced stop means on the tubular member engageable with the pin to form a lost motion connection between the rod and the tubular member.

6. A magnetic control device comprising a support adapted to be mounted in the top of a tank and having a horizontal non-magnetic wall portion, a guide extending below the horizontal wall portion, an elongated tubular member slidably supported by the guide for vertical movement toward and away from the wall portion, a magnetic armature carried by the tubular member adjacent its upper end, an actuator rod slidable in the tubular member, a spring urging the rod in one direction, a liquid displacer connected to the rod to urge it in the other direction, and a lost motion connection between the rod and the tubular member.

7. A magnetic control device comprising a support adapted to be mounted in the top of a tank and having a horizontal non-magnetic wall portion, a guide extending below the horizontal wall portion, an elongated tubular member slidably supported by the guide for vertical movement to-

ward and away from the wall portion, a magnetic armature carried by the tubular member adjacent its upper end, an actuator rod slidable in the tubular member, the tubular member having an elongated axial slot therein, a pair of pins on the rod projecting through the slot, a coil spring around the tubular member engaging one of the pins and the guide to urge the rod upward, a liquid displacer on the rod to urge it downward, and spaced nuts threaded on the tubular member and engageable with the other pin to form a lost motion connection between the rod and the tubular member.

BENJAMIN L. BINFORD.

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